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Systematic review - Resilience and return to work pain interventions

Abstract

Background: Resilience is a developing concept in relation to pain, but has not yet been reviewed in return to work (RTW) contexts.

Aims: To explore the role of resilience enhancement in promoting work participation for chronic pain sufferers, by reviewing the effectiveness of existing interventions.

Methods: Resilience was operationalised as: self-efficacy, active coping, positive affect, positive growth, positive reinforcement, optimism, purpose in life, and acceptance Five databases were searched for randomised controlled trials (RCTs) whose interventions included an element of resilience designed to help RTW/staying at work for chronic pain sufferers. Study appraisal comprised the Cochrane Risk of Bias (RoB) tool and additional quality assessment. Findings were synthesised narratively; between-group differences of outcomes were reported. Heterogeneous PICOS elements precluded meta-analysis.

Results: Thirty-four papers from 24 RCTs were included. Interventions varied; most were multi-disciplinary, combining behavioural, physical and psychological pain management and vocational rehabilitation. Four trials found RTW/staying at work improved with intensive multidisciplinary interventions compared to less intensive, or no, treatment. Of these, one trial had low RoB; three scored poorly on allocation concealment and selective outcome reporting. Four trials had mixed results e.g. interventions enabling reduced sick leave for people on short not long-term leave; 16 trials had no improvement. Five trials reported resilience outcomes were improved by interventions but these were not always trials in which RTW improved.

Conclusions: The effectiveness of resilience interventions for chronic pain sufferers to RTW is uncertain; and was not as helpful as anticipated. Further agreement on its terminology, and that of RTW is needed.

Key words: Work; chronic pain; occupational health.

Introduction

There is compelling evidence that safe, appropriate work confers economic, bio-psycho-social benefits for workers and their families (1-3) and strong evidence that worklessness is associated with poorer physical and mental health outcomes for working age adults (4) including those with chronic pain (5,6).

Chronic pain can be defined as pain that fluctuates, lasting over three months, which may beintractable (7,8). It is estimated one in five Europeans has chronic pain (9); and it was recently reported that 25-35% of adults report chronic pain (5). Chronic pain can negatively impact on work (5,10); an observational studies review reported that it has substantial deleterious effects on work absenteeism and presenteeism (11). It is therefore useful to consider what makes a chronic pain sufferer who wants to (re) enter or sustain working life resilient.

Defining resilience is complex; it is debated whether it is an outcome, process, state or trait (12-14). Resilience enhancement arises from positive psychology, notably the Broaden-and-Build and Self-Determination Theory (15-16). There is agreement that resilience can be defined as a dynamic process encompassing positive adaptation in the face of adverse experiences that would otherwise lead to poor outcomes (17-19). Resilience is a complex, multi-faceted phenomenon, but it may help us understand why some people seem relatively protected from stress compared to others (14, 20-21). It is thought that having a resilient personality (i.e. having emotional flexibility and availability to problem-solve), can protect older adults against adverse effects of chronic pain and may help explain individual differences in pain acceptance if considered a stable trait involving the ability to adapt to adversity (22).

A recent review conceptualised resilience when one is in pain as being able to recover from disability and depression, sustaining functioning in the presence of pain (23). This psychological flexibility

model, which includes acceptance, mindfulness and committed action, could be important to consider when conceptualising resilience in pain (24). These authors also suggest that acceptance and commitment therapy (ACT), which promotes behaviour change rather than symptom reduction, may be key; there is a growing evidence for the utility of these models in reducing pain-related suffering (25). The authors argue that promoting resilience mechanisms may be useful for both interventions and prevention strategies; it is methodologically challenging to operationalise and measure the dynamic characteristics of resilience mechanisms such as psychological flexibility; we need to know more about resilience when one is in pain (23).

Another recent review demonstrated overlap between pain resilience, pain acceptance, psychological flexibility and pain self-efficacy (26) and concluded that pain resilience is a "dynamic process related to both stable individual characteristics and contextual and state factors, such as goal contexts and affective states" . We have synthesised key factors from the research above, and from communications with leading resilience and pain researchers, to inform our search strategy (appendix 1) and to inform our conceptualisation of interventions with resilience components as those which aim to improve self-efficacy, active coping, positive affect, positive growth, positive reinforcement, optimism, purpose in life, and acceptance, all per se and in relation to pain.

Currently, a resilience enhancing approach means shifting towards the inclusion of positive outcomes (sustainability) in addition to one's ability to recover from negative outcomes (pain and distress). Resilience is a growing area in the pain literature and we wanted to apply its utility to looking at helping pain sufferers return to or stay in work. Although many interventions utilise resilience enhancing techniques, they are often not referred to as such, and their use can be under-theorised. Our aim is to identify the role of resilience enhancing techniques in existing interventions to assess their effectiveness, in order to provide the basis for a more focused approach that might assist practising occupational physicians, and others interested in sustainable working lives for pain

patients. No-one has yet attempted to group interventions according to a clearly operationalised set of criteria arising from a literature review and in-depth conversations with leading experts. This is what we attempt here, to see if resilience, while complex, could be a useful concept, by which to understand how to help people return-to-work. Our review focuses on interventions that address resilience by changing individual cognitions and practices. Future research might examine the role of workplace factors on promoting resilience.

Our literature search found no other systematic reviews of the role of resilience enhancing techniques in interventions designed to enable chronic pain sufferers to stay at work or return to work. There are some related studies. A 2012 review examined the effectiveness of community and workplace–managed interventions to manage musculoskeletal-related sickness absence and job loss (27). It found that most interventions appeared beneficial although effects were smaller in larger and better-quality studies, suggesting publication bias; also, the effort-intensive interventions were less effective than simple ones. Musculoskeletal-related sickness absence is similar to chronic pain sickness absence in terms of how both are measured (28) and the review's inclusion of behaviour change techniques is related to the interventions we map onto resilience training in our review. However, our review covers all chronic pain, and any intervention with any element of resilience as conceptualised here and delineated in the primary and secondary outcomes, below.

A recent meta-analysis of cohort studies examined absence from work and return towork (RTW) for back pain sufferers (29). The pooled estimate suggests a good RTW rate but the 32% not back at one month are key to target in preventing long-term absence. This review provides important data regarding ascertaining if interventions designed to bolster resilience do so, and we consider the length of time participants have been off work as part of our study.

Another meta-analysis was conducted on the effectiveness of psychological interventions for chronic pain (excluding headache) on health care use and work absence (30). Nine of the 18 randomised controlled trials (RCTs) reported work loss as an outcome. No effects of psychological interventions on work loss were found (although the studies were considered heterogeneous). In contrast, in our review we have broadened the criteria to include any intervention designed to assist RTW or staying at work for chronic pain sufferers (including headache sufferers), which has any element of resilience within it.

Our review objective is to consider if resilience is a useful concept by which to conceptualise RTW interventions for pain patients, examining the effectiveness of RCTs of interventions which include any key element of resilience designed to assist RTW or staying at work for adult chronic pain sufferers.

Methods

This review was planned and conducted in accordance with PRISMA guidelines, following a predetermined protocol registered on PROSPERO (CRD42015023504). Protocol deviations are documented in appendix 4. Eligible papers met these criteria:

- Participants: aged 18+ with chronic pain (diagnosed or labelled using any recognised criteria) who are either in any kind of employment or attempting to (re)enter employment through any (RTW) scheme.
- Interventions: designed to assist RTW or staying at work for chronic pain sufferers, which has any element of resilience within it (specified below).
- Comparators: a group offered a control such as placebo, no treatment, wait list, usual care/treatment-as-usual (UC/TAU).
- Primary outcome measures:

  RTW or staying-at-work measures (via any quantifiable method capable of being validated).

Resilience (as measured by any validated resilience scale plus any validated scales measuring the following aspects of resilience:self-efficacy, active coping, positive affect, positive growth, positive reinforcement, optimism, purpose in life, and acceptance, all per se and in relation to pain.). Baseline through to last available follow-up results will be reported. We only report between-group analyses from outcomes that conform to our inclusion criteria.

- Secondary outcome measures (measured using any validated scale):

Pain intensity

Pain interference

Pain disability

Fear of work avoidance beliefs

Completed, published randomised controlled/clinical trials were included. MEDLINE, Embase, PsycINFO (via Ovid), the Cochrane Library and Web of Science were searched from inception to May 2017, using MeSH and key word terms (see appendix 1 for search strategy). The first 20 pages of Google Scholar were searched. No language restrictions were imposed. We are only reporting on RCTS in this paper but searched for all primary study types (systematic reviews, RCTs, observational and qualitative). Findings regarding RCTS are reported here. Observational and qualitative studies were sought to assess harms and consider why people may respond differently to the same objective experiences of interventions at work. These findings will be reported in subsequent papers.

All titles and abstracts of studies were independently screened by two reviewers (EW, RP). Disagreement was resolved via discussion with a third reviewer (DW). The full text of potentially eligible studies was retrieved. Studies were translated into English where necessary. Each study was read in full and independently assessed by two reviewers. Any disagreement was resolved via discussion with a third reviewer. The reference lists of all full-text articles were hand searched for

additional studies. Relevant systematic reviews were also screened for potential trials. Authors of any RCT protocols/abstracts were contacted to establish trial status. Details of the selection process are summarised in the inclusion flowchart (Figure 1). Excluded articles, alongside reasons for exclusion, are available from the lead author on request.

We collated multiple reports that related to the same study, so that each study rather than each report was the unit of interest in this review. Data were extracted from included studies for assessment of study quality and evidence synthesis using a data extraction form piloted prior to the start of the review and refined to ensure consistency. Study authors were contacted for missing data. Data were extracted independently by one reviewer from the review team (EW, RP, DW, JX, NC) and checked by a second, who then met to agree data exaction, risk of bias (RoB) and methodological quality. Disagreements were resolved via discussion with a third reviewer. Extracted data included: study setting; population/participant demographics and baseline characteristics; details of intervention and comparator; study methodology; recruitment and study completion rates; outcomes and measurement times; suggested mechanisms of intervention action; information for assessment of risk of bias and study quality. See Table 1 for characteristics and main results of included studies.

The Cochrane risk of bias (RoB) assessment was used (31). This was supplemented with methodological quality assessment (guided by previous work 32-33; see appendix 5 for full details). We conducted a narrative synthesis of findings from included studies structured around the type of intervention, target population characteristics, type of outcome and intervention content. We summarised the intervention effects for each study by reporting between-group differences, only with the primary outcomes. We suggested a priori that there would be limited scope for meta-analysis because of the range of different outcomes measured; this was so. We aim to categorise studies according to which resilience concepts interventions use.

Results

The literature search identified 3348 records. Once duplicates were removed, 1024 records were screened and assessed against eligibility criteria (Figure 1). Seventy-five full text articles were assessed for eligibility from the database search and hand searching. After further exclusion, we identified 34 papers pertaining to 24 RCTs for inclusion. In total we excluded 41 records. The most common reason was inability to separate out participants with chronic pain from other conditions or sub-acute pain (the list and full reasons are available on request). Characteristics and main results of included studies are summarised in Table 1. Risk of Bias is summarised in Table 2 (fuller included study details are in Table 3, appendix 2, and the Quality Assessment is summarised in Table 4, appendix 3). We contacted 19 authors for clarity regarding eligibility; 8 responded. Additional unpublished data was obtained from two included studies (34, 35) regarding the percentage of participants on sick leave (SL) and length of pain respectively.

[figure 1]

The 24 included studies were published between 1992-2017. Seven trials occurred in Sweden, 4 in each of Denmark, Norway and The Netherlands, and 1 in each of England, Finland, Germany, the USA, and Hong Kong.

The sample size randomised totalled 6795 (range 45-664, mean 243); inclusion criteria varied between studies. Participants' age ranges were not always stated, although the lowest stated limit was 18 and the highest upper was 65 (36-38; 39; and see Table 3 appendix 2 for means). It varied between and even within trials whether participants were on SL from work, onbenefits, or in work. Pain conditions, type of job, whether on SL or not, and SL duration if applicable, varied greatly across studies and was not always stated. There was heterogeneity within trials e.g. one included patients who had a paid job, (working full or part-time, or on SL) who felt their workability was threatened by

disease-related problems (40). Whilst some studies reported International Classification of Primary Care (ICPC) criteria to describe pain, terminology was often used inconsistently across studies e.g. it was unclear what the differences may be between Chronic Widespread Pain (CWP), or musculoskeletal (MS/MSK) pain.

Interventions varied in design and intensity but most were multi-disciplinary; combining behavioural, physical and psychological aspects of pain management (see Table 3, appendix 2). Physical elements focused on clinical examination, ergonomics, exercise, stretching and relaxation. Psychological elements focused around Cognitive Behavioural Therapy (CBT); active coping strategies in general and particularly for stress and pain management; goal-setting to enable sustainable behaviour change; improving self-efficacy and motivation and reducing fear. Some included participant-led rehabilitation planning with specialist case-workers and vocational guidance. A minority included direct workplace visits and interactions with work managers. Some trials' interventions used multiple resilience concepts and some only one. Therefore, we could not effectively group studies conceptually according to resilience concepts.

Comparisons were UC, TAU, or different interventions compared against each other instead of UC/TAU. UC varied from no treatment (although participants could seek treatment elsewhere in trial 41), to quite extensive treatment regimes (e.g. TAU involved individualised education, lifestyle advice by a specialist and sometimes physiotherapy and social support in one trial, 42). Many studies compared different interventions against each other with no TAU group (e.g. 43; 44; 45; 46).

Assessment schedules varied (range 3-24 month follow-up (FU) period, mode 12 months), with varying intervals between, usually three monthly for shorter trials and six monthly for longer. One trial (35) had a 54-month FU; two (36-38; 47) had ten-year FU periods.

RTW or staying at work was a primary outcome in all but 4 (39; 42; 48-49; 50) included trials. Studies varied greatly in how RTW or staying at work were operationalised. Essentially, there were three strands. Studies either looked at RTW self-report or insurance data; or the same for SL; or measured occupational performance including employment readiness and impact of condition on daily function. Exemplifying the complexity, RTW was operationalised in many different ways, e.g. the first 4-week period within the first year after inclusion during which participants received no social transfer payments (45); the first 5-week period people did not receive sickness or workplace benefits (46); work readiness, defined as having a job, being in education or seeking work (43).

Four trials found RTW/staying at work was improved by intensive multidisciplinary interventions compared to less intensive treatment (the total number of sickness-related days' absence, was lower in intervention group at 10-yr FU ($p<0.05$) though also at 3 months before treatment ($p<0.05$) (36-38); higher work readiness in intervention group, ($p=0.001$) (43); ($p< 0.01$) (64) or no treatment (increased RTW in intervention group, ($p<0.001$), 41). Four trials (34, 35, 65-66; 51; 63) showed mixed results such as CBT-based RTW interventions being more effective for reducing the number of SL days for those on short but not long-term SL. The remaining sixteen trials showed that targeted interventions did not improve work outcomes compared to other arms. In some cases, an intervention was better than the reference group at returning people to work or keeping them in work, but this was not the resilience intervention.

Regarding primary outcome 2, resilience measures, studies varied regarding which resilient concepts they measured and how. Concepts identified included active coping (n=4), self-efficacy (n=4) (plus back-pain specific self-efficacy, (n=1), and other affect-related issues such as health locus-of-control (n=2), and changed ability to work related to pain (n=7).

No studies used validated resilience or pain resilience scales. Resilience concepts were a secondary outcome in 7 trials (36-38; 39; 44; 45; 48-49; 50; 51). Six trials had interventions with resilience

elements but did not report resilience outcomes (41; 43; 46; 52-54; 55; 56). Five trials reported positive resilience outcomes finding that: self-efficacy increased initially, although this was not sustained, whilst improved sickness-related absence was (36-38); all emotional states improved even though occurrence of job loss did not (40); work absence and emotional resilience improved for women only (47, 67-8); both coping and work outcomes improved (50); some coping measures improved and SL was reduced for those on short-term leave (63).

Results for secondary outcomes (pain levels and intensity, interference, disability; fear of work avoidance beliefs) are as follows. Most trials measured pain levels via visual analogue scales (VAS). Seven trials measured pain intensity (39; 44; 46; 52-54; 56; 57-59; 60), two measured pain interference (39; 61), and ten measured pain disability (36-38; 43; 44; 45; 46; 56; 60; 61; 62; 63). Only three trials measured fear of work avoidance beliefs; two via the Waddell Fear-Avoidance Belief Questionnaire FABQ 7-item work subscale (45, 46); one trial used 4 of these items (44). Even when RTW did not improve, secondary outcomes often did (e.g. 37 pain-related disability, though not at ten-year follow-up, 38; 50, 57-9 and 62 pain levels; 52-4 all pain measures but only for some pain locations with long-term pain); see Table 3 appendix 2.

[table 1]

For risk of bias, in all cases bar one, follow-up studies or sub-group analyses papers were assessed as having the same risk of bias as the original trial so are reported together (e.g. 36 and its two follow-ups 37 and 38 are grouped together in Table 2). The only exception to this is for Jensen et al 2001 (47) and its ten year follow-up Bergstrom et al 2012 (68), which were given different ratings so are reported separately in Table 2. For the 24 trials, blinding was the main source of bias regarding scoring poorly. Risk of bias due to blinding of participants was rated as high in 15 trials, unclear in 8 and low in 1. However, it was often impossible to blind participants; since RTW is a relatively objective outcome, this may not be a key issue. It was unclear if outcome assessors were blinded in

12 trials, 8 were rated as high risk and 4 as low. It was unclear if other study personnel were blinded in 8 trials, 16 were rated as high risk and none as low. Trials scored better at review level on these criteria as follows: random sequence generation (20 low, 3 unclear, 1 high), allocation of treatment concealment (12 low, 10 unclear, 2 high), completeness of outcome data (12 low, 8 unclear, 4 high), and selective outcome reporting (23 low, 0 unclear, 1 high).

[Table 2]

For quality assessment, papers not trials were initially assessed separately since different papers recorded different elements of the quality criteria, particularly on number and reasons for withdrawals (see Table 4, appendix 3). Papers were grouped together if possible around the same trial, when ratings were the same. This resulted in 28 sets of quality assessment reported in Table 4 pertaining to the 24 trials. For quality assessment criterion 'was the number of withdrawals/dropouts mentioned?', 25/28 ratings were positive as this was mentioned. For criterion 'were reasons for withdrawals/dropouts given?', 12/8 ratings were positive. For criterion 'was practitioner level training satisfactory?', 27/28 ratings were positive. For criterion 'was therapeutic time between groups equivalent?', 13/28 ratings were positive. For criterion 'was a power calculation conducted?', 17/28 ratings were positive (although 4 of these stated they were underpowered). For criterion 'were groups similar on prognostic indicators' 25/28 ratings were positive. Therefore, at review level, studies scored highest on quality assessment with nearly all rated as having satisfactory practitioner level training, mentioning number of withdrawals and groups being similar prognostically. Only around half were rated positively for conducting power calculations; around one third for having equivalent therapeutic time between groups, and giving reasons for dropouts.

Discussion

Four trials found RTW/staying at work improved with intensive multidisciplinary interventions compared to less intensive treatment (36-38; 43; 64) or no treatment (41). Four trials (34, 35, 65-66; 51; 63) had mixed results such as interventions enabling reduced SL for people on short not long-term leave. Five trials reported resilience outcomes were improved by interventions (36-38; 40; 47,67-68; 50; 63).

Of the four trials that found improved work outcomes, two (41; 43) conceptualised RTW as 'readiness to work' amongst participants with a threatened job situation including being on SL and having no job; in one trial (64), people were already working; and the fourth (36-38), did not specify work status, making cross trial comparison difficult. Furthermore, apart from blinding issues (viewed as relatively unproblematic as described above), one trial had low RoB (36-38); three scored poorly on allocation concealment and selective outcome reporting (41, 43, 64; see Table 2).

Regarding the four trials which presented mixed RTW results, this may be partly to the difficulty of returning chronically suffering people to the labour market. For example, one trial (34) found that whilst there was no difference between groups on full RTW, there was on partial RTW. A CBT-based RTW intervention applying pain coping skills for employed women on SL with musculoskeletal pain found it more effective for reducing the number of SL days for those on short but not long-term leave (63). Short-term here was up to one year, (mean = 3 months). Treated participants on long-term SL did not reduce their SL more than their controls nor improve on any of the psychological measures but we do not know why. Possibly their sick roles were too established.

One trial showed that participants with a good prognosis did equally well with ordinary treatment; those with medium benefitted more from the 2 multidisciplinary treatments (MDTs) and those with poor did better with the extensive MDT (35). Follow-up studies showed different outcomes when stratified by pain condition and gender (65-66). Tables 3 and 4 show issues with bias and quality and

we need to know more about use of screening, since only poor prognosis participants did better with extensive MDT which is also expensive, so may not be needed by those with a good and medium prognosis. Later review authors (69) point out that by sub-grouping patients from an original trial (57) into different prognoses for RTW and at the same time, offering different treatment programmes, better results were achieved. These review authors (69) also highlight that sub-group analyses showed that classifying patients with long-term MS pain (according to International Classification of Diseases revision 9, or ICD-9, criteria) revealed treatment effects depending on different types of treatment (65,66). Men and women responded differently with women faring worse in these set of studies e.g. In sub-group analyses from an original trial (35) on patients with lower back pain (LBP) only, men with LBP randomised to light MDT returned to work more often than those randomised to extensive MDT or TAU but there was no difference for women (65). This may be due to psycho-social factors such as women doing more domestic work, negative career orientation and more illness behaviour (65). Treatment effects decreased with age in women. However, women only reported better quality of life (QoL) in an intervention group which used MDT and also included workplace visits (65). Another trial (47) also reported better outcomes for women only - suggesting women may do better as they are more open to psychosocial explanations and treatments for pain. The right treatment therefore may depend on prognoses, sex, and age, at least. Thus for healthcare providers, it is hard to decide who will do best with what treatment. Much more needs to be known about the effect of these variables.

Sixteen trials reported that their interventions were not better at returning/keeping people in work. Trial authors suggest that the multi-faceted nature of pain means health-carers must work hard to enable patient-centred communication (34, 70).

Some studies found that whilst RTW did not differ between groups, QoL and pain-related measures showed improvement discussed as being important for the longer term (notably trial 58).

Five trials reported positive resilience outcomes (36-38; 40; 47,67-68; 50; 63) but these were not always trials which also reported positive work outcomes, and further complexity is provided since emotional resilience improved for women only in one trial (47, 67-8).

Blinding was the main source of bias. Participants were not blinded in over half the trials (often blinding was impossible; this may be less important given the relative objectivity of the return-to-work outcome). Sequence generation, allocation of treatment concealment, completeness of outcome data, and selection of outcome reporting were the least biased criteria with many trials scoring as low risk. We were less strict with the selective reporting judgement as we did not mark papers down if there was no protocol, rather we simply checked against the methods section.

Quality assessment was very mixed, for example nearly all studies had groups who were similar on prognostic indicators, mentioned withdrawals, and had satisfactory practitioner-led training, but only a third gave reasons for drop outs, and only a third had equivalent therapeutic time between groups. About half the trials conducted a power calculation (with four considered underpowered).

The search strategy was comprehensive, but it is possible that some published and unpublished randomised controlled trials may have been missed. Publication bias is problematic in clinical research (71). Almost all RCTs were either poorly blinded or it was impossible to blind. Some of the TAU arms were so extensive that they were similar to actual intervention arms in other trials, making comparison difficult.

Heterogeneous methods of operationalising not only resilience but RTW, coupled with unclear reporting and risk of bias in trials conducted to date, means we cannot draw firm conclusions on the

effectiveness of interventions designed to assist RTW or staying at work for chronic pain sufferers which address resilience. A recent review also commented on the heterogeneity of cross-country operationalisation of RTW (72).

Another recent meta-analysis examined effectiveness of workplace-based return-to-work (RTW) interventions and work disability management interventions that assist workers with MSK and pain-related conditions and mental health conditions (73). It found strong evidence that duration away from work from both MSK or pain-related conditions and mental health conditions were reduced by multi-domain interventions encompassing at least two of the target domains (health-focused, service coordination, and work modification interventions). Our review provides limited evidence that RTW and SL rates can be improved by MDT interventions that include resilience and in practice the interventions which did show such improvements cover the health-focused domain, the service co-ordination domain but not usually the work modification domain.

Resilience may yet be too broadly operationalised to help in thinking about why some RTW interventions for pain sufferers help and some do not. It may have more utility in supporting work participation if there was agreement on the terminology, operationalisation and measurement of not only resilience but RTW factors. This is challenging given the different social insurance systems across countries for RTW and the on-going debate around what resilience and pain resilience are (23; 74-75). For example, no trials used any resilience or pain resilience measures. The latter is unsurprising as pain resilience measures are new (76) but we had expected the former given the interest in promoting resilience in pain patients in general – it was missing from helping sustainable return to work. The studies we analysed did not explicitly set out to test resilience-building but did include elements of it if one accepts resilience includes raised self-efficacy (and the other concepts from our operationalisation). Our results show that only some of the trial interventions were

successful, although questions remain regarding the role of resilience and what might be achieved if resilience building was further, and more consistently, foregrounded.

A new body of research is beginning to consider how ACT may connect with resilience (23); a recent trial showed that adding telephone follow-up to an ACT- based occupational rehabilitation programme boosted work participation at 1 year follow-up for participants on SL (30% of whom had musculoskeletal pain on their sick notes and 75% reported clinically significant chronic pain symptoms, 76). This is promising and extends some of the secondary outcome findings in one trial here who used an ACT-based tailored behavioural treatment to attain a significant reduction in sickness absence at 10 years' follow-up (although other outcomes' positive effects were not maintained; 36-38).

Notwithstanding the complexities of defining resilience, pain conditions, status of working, type of job, and being on SL or not, all varied greatly across studies and was not always stated but needs to be in future studies. Ideally, quality issues such as keeping therapeutic time equivalents and reducing risk of bias by not reporting outcomes selectively should be addressed. The review studies' participant age ranges are expected in the context of RTW historically; future studies may need to increase the upper age limits as the extending working life agenda gains importance (77.

We need to know more about treatment effects in relation to gender, age, prognoses and type of work. Some authors (66,69) note they did not register work types, so could not categorise participants into more homogenous groups. No trials considered the extent to which participants were under financial obligations to work. Few trials covered direct interactions between workplace and line managers, often seen as key in the RTW literature (78.

In conclusion, there is uncertainty regarding effectiveness of resilience interventions for chronic pain sufferers regarding RTW/ staying at work rates. This is due to heterogeneity of resilience as operationalised, but also to how RTW/SL are reported, due to differences incountries' social insurance systems. Grouping interventions according to key resilience concepts is challenging; resiliencewas not as helpful as anticipated at this formative stage. We need further agreement on the terminology, operationalisation and measurement of not only resilience but RTW factors.

Key points

- This is the first review looking at whether interventions using key concepts of resilience improve work outcomes for adults with chronic pain.
- Most interventions were not effective in improving work outcomes or key resilience outcomes such as self-efficacy, but some did show improved health-related quality of life scores.
- Resilience may be a useful grouping concept. We need to know more about effects of gender, prognosis, aging, and type of work, when considering helping people in pain return to work.

Competing interests

None declared

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Acronyms

ACT Acceptance and Commitment Therapy
CBT Cognitive Behavioural Therapy
CWP chronic widespread pain

FU	follow-up
ICPC	International Classification of Primary Care
LBP	lower back pain
MDT	multidisciplinary treatment
MS(K)	musculoskeletal pain
QoL	quality of life
RCT	randomised controlled trial or clinical trial
RoB	risk of bias
RTW	return-to-work
SL	sick leave
TAU	treatment as usual
UC	usual care
VAS	visual analogue scale

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Table 1: Summary of characteristics and main results of included studies

	1st author, date, country	*N = total Intervention (I) Control Group (CG) randomised (analysed)*	*intervention*	*control/comparison group*	*assessment schedule Baseline (BL) and schedule*	*primary outcomes- RTW, SL (return- to-work, sick leave, or staying at work measures) R (resilience concepts)*	*main results + or – (Sig. diffs)*
1	Alaranta (1994), (62) Finland	N= 378 (293) IG: 152 CG: 141	3 wk. prog.of physical training & CBT disability management	3 wk in-house rehab. Prog	-BL; 3, 12 mths	-SL: total no. of sick days in a 12 mth period - Resilience (MHLC & SAS)	-SL -R
2	Altmaier (1992), (61) USA	N: 45IG = 24 (21): CG = 21 (21)	Psychological Prog. .	Standard Treatment	-BL; discharge (at 3wks); 6 mths	-RTW (if pt was working FT or PT training); -Resilience: 20 item self-efficacy scale, & WHYMPI	-RTW -R
3	Andersen (2015), (51) Denmark	N = 141 (N =94) I1: = 47: I2 = 46: CG: = 47	IG1: Chronic Pain Self-Management Prog. IG2: Tailored Physical Activity	Reference group	-BL; end of 3 mth Int.	-Sick-listed status (yes/no); Duration of sickness absence period	+RTW (TPA gp not CPSMP)
4	Asenlof (2005) & FU: Aslenlof (2009) Emilson (2017), (36, 37, 38) Sweden	2005: 122: IG = 57: CG = 65 2009: 122 (97): IG=65: CG =57 2016: 43 (44%): IG= 20:CG=23	Tailored Behavioural Treatment	Exercise-based Physiotherapy Treatment	-BL; -3, 12, 24 mths paper); 10 yrs	-Sickness related absence[1] -(Functional) self-efficacy[1] (SES, Swedish V)	+SL (2017 paper only, TBT gp) +R (2005 paper only)
5	Bendix (1995), (43) Denmark	N = 132 (106) I1 = 46 (40): 12= 43 (31): I3= 43(35)	I1: Intensive, multidisciplinary functional restoration	I2: active physical training I3: active +psycho-physical prog.	-4 mths	-RTW defined as work readiness -SL (days)	+ RTW +SL
6	Bendix l (1996), (41) Denmark	N = 106 (94) IG=55 (45), ATW (27%) CG=51 (49), ATW(16%)	I1 Intensive, MD functional restoration: see Bendix (1995)	CG: Not treated – could go elsewhere for treatment.	-4 mths	-RTW defined as work readiness -SL (days)	+ RTW +SL
7	Bernaards (2006, 2007, 2011) (52, 53, 54) The Netherlands	N = 466 I1 = 152: I2 = 156: CG= 158	IG1: Work Style IG2: Work Style/lifestyle PA	UC (Dutch guidelines)	-BL; End of 6 mth int (ST pain); -12 mths after start (LT pain)	-Degree of recovery (self-reported 7 pt scale) -Disability at work (0-11 scale)	-R
8	Bergbom (2014), (44) Sweden	N=105[a] IG1=28 (18*): IG2=32 (24*): IG3=45 (37*)	-I1: Activity training: -I2: Graded exposure in vivo - I3: Broad CBT	No true control group	-BL, PI -9 mths PI -1x wk through treatment.	Measured before & after treatment: -SL (self-report of 14 days or more)	-SL
9	Brendbekken (2017) (34) Norway	N: 284 IG= 141: CG= 143	MI: ISIVET	BI: Active control group	-2 wks,3 mths (MI); 2 wks (BI); Mthly for 24 mths (all)	-RTW fully and partly (if > 50% of work days/ mth spent on SL)	- FT RTW +PT RTW
10	De Buck (2005), (40) The Netherlands	N= 140 I: N=74: CG =66	Job retention vocational rehab. prog	UC	-BL; 6,12,18,24 mths	-Occurrence of job loss (complete work disability or unemployment). Resilience RAND 36	- job loss +R
11	Eijk-Hustings (2013), (42 The Netherlands	Total N=203 (134) IG1, MD gp=108(67): IG2 =47(19): UC =48	I: 2 phases, MD phase 1 also IG1, then aerobic exercise (AE) phase 2, also IG2	UC	-12 wks; 18 mths	-HR QoL, using EQ-5D -SL measured by self-developed questionnaire -impact of FM on functioning (FIQ[1], workability subscale)	-R -SL
12	Ewert (2009), (39) Germany	Total N = 202 (169) I1 =92 (83): CG = 91(86)	I: 13 wk programme - Multimodal secondary prevention	13 wk exercise prog.	-BL; PI; 3, 12 mth	Resilience: (WHYMPI)[1]; (CSQ)[1]; bain specific self-efficacy[1]; (GSE)[1]; (SF36 (PCS) & SF36 (MCS))[1]	-R
13	**Haldorsen (1998a,b)** & 12 mth FU (1998c), (57, 58, 59) Norway	N: 469 IG = 312 (293): CG =157 (94)	IG: Multi-modal CBT	TAU GP Care	-BL; 4 wks; 2,6,10 mths -1 yr FU	-RTW (Norwegian National Health Insurance Register data)	-RTW

	Haldorsen 1998c (59) Norway (Bergen study)	N = 223 IG= 142: CG = 8	I1: Multi-modal CBT	TAU GP care	-BL; 4 wks; 2,6,10 mths, 1 yr FU	-RTW	-RTW
14	**Haldorsen (2002)** (35) Skouen (2002) (65), Skouen (2006a) (66) Norway	Total = 654 (627) as RTW data not available on gov. workers (n = 27) IG1 =169(165), 57), 42 IG2 = 222(214),52 81 CG = 263 (249),86) 85	I1: Extensive MD treatment (EMD) I2: Light MD treatment (LMD)	TAU GP advice (called OT, ordinary treatment)	-BL testing (screening for prognosis) -Treatment (1-2 mths later) -Every mth for 14 mths	-RTW (absence of sick pay per mth)	+RTW for medium prognosis participants -RTW for poor prognosis & good prognosis
	Haldorsen (2002), (35) **Skouen (2002),** (65) Skouen (2006a)(66) subgroup analyses of LBP pain (35)	N – 664, 211 were pts with LBP I1= 52: I2= 57:CG = 86	As for Haldorsen (2002)	As for Haldorsen (2002)	-BL; 26 mths ; Mthly, with p values reported at 12, 18 & 24 mths PI	-RTW (proportion of pts back at FT work, recorded every mth) (M & F analysed separately)	+RTW men LMD gp -RTW for women
14	Haldorsen (2002) (35) Skouen (2002) (65) **Skouen (2006a) (66)** subgroup of CWP only from Haldorsen (2002) comparing RTW in 3 gps during first 54 mths after treatment	CWP subgp (data on the 215 with CWP (208 pts) as RTW data was not available on gov. employees). Randomised to: TAU N=88 (85) LMD N= 83 (81) EMD N = 44 (n = 42)	As for Haldorsen (2002)	As for Haldorsen (2002)	-54 mth FU from end of treatment	-Proportion of pts who fully RTW for each mth in FU period; -Days absent from work. (M & F analysed separately)	+ RTW female EMD gp -RTW men LMD gp
15	Hutting (2013, 2015), (48, 49) The Netherlands	N=123 IG= 66 (64): CG = 57 (53)	Self-management of CANS programme (SG)	UC + information available	-BL; 3, 6, 12 mths	-Absenteeism (SPS-6 Dutch V & WLQ) [1]; Resilience (SEWS) [1]; (VBBA[1]); (GSES[1] Dutch V)	-RTW -R
16	Jensen (1997a), (60) Sweden	N = 63 (54) IG1 = 33 (29): IG2 = 30 (25)	EI	RI	-1 wk before treatment -PI, 6 mths PI, 18 mths PI	-SL (over 14 days); Resilience :(CSQ, Swedish V); GSI)	-SL -R
17	**Jensen (2001, 2005)** Bergström (2012), Sweden (47, 67, 68) (2005 paper is 36 mo FU: 2012 paper is 10 yr FU)	N=214 IG1 BMR: 63 (49; 47) IG2 PT 2: 54 (48; 50) IG 3 CBT: 49 (41) CG: 48 (0; 28) No.s analysed vary over FU and measures.	I1: Behavioural medicine rehabilitation I2: Behavioural-oriented physiotherapy IG3: CBT	UC	-Pre-treatment -Post-treatment -6, 18 mths -36 mths (2005 paper only)	-SL - early retirement -Resilience: (SF-36)	-SL +R (females only)
17	**Bergström (2012),** (10 yr FU of Jensen 2001) (68) Sweden	Ppts were classified into 1 of 3 subgroups based on the MPI-S N = 194 (187) **IG1** = (AC 13, ID15, DYS 22) **IG2** = (AC 18, ID13, DYS 23) **IG3** = (AC 18, ID8, DYS 18) **CG** = (AC 18, ID11, DYS 17)	As for Jensen et al (2001, 2005)	UC	-10 yrs	-Registered sickness absence after rehab. over a 10-yr FU	-SL
18	Jensen (2011), (45) Denmark	N=351 (344) **I1**=176 (176**, 124***)**: I2** =175	Hospital based MD intervention	Brief intervention	-BL; 12 mths	-RTW (1st 4 wk period with no social transfer payments)	-RTW

		(175**, 120***)					
19	Li (2006), (64) Hong Kong	N: 64 **IG**=34: **CG** =30	-3-wk prog. of individual vocational counselling and gp-based training.	Waiting List	-BL; -3 mths	-RTW conceptualised as readiness to work (C-LASER); Resilience (self-report); (C-LASER, SF-36)	+RTW (readiness to work)
20	Lindell (2008) (55) Sweden	N= 147 (125) **IG**=63: **CG**= 62	CBT rehabilitation prog. -Phase 1 (2-8 wks); Phase 2 (2-8 mths)	Primary care treatment	-6,12, 18 mths	-RTW share RTW chance Net days SL	-RTW share, chance or SL
21	Linton (2005), (56) Sweden	N = 185 **I1**=69 (14): **I2** =69 (61) **CG** =47(43) at 1 Yr	I1: CBT + medical treatment (as for UC). I2: CBT+Physical Therapy) focusing on exercise.	UC: Medical Treatment	-BL; 12 mths	Work absenteeism split into SL and risk of being off work in the LT/developing LT sick disability leave -SL (no days SL per mth during the 6 mths prior I and during the previous 6 mth period at FU) -risk of developing SL and LT SL SL taken during past year at pre-test and at 1 yr FU)	-SL
22	Macedo (2009), England (50)	N = 32 (no drop outs) **IG** = 16: **CG** = 16	Occupational Therapy (OT) & UC together	UC	-BL, 6 mths	-Resilience: (COPM); -work productivity via work days missed/ mth[1] (- AIMS2[1] AHI[1] (EQ-5D)[1]	-RTW (work productivity) +R
23	Marhold (2001), Sweden (63)	Total N=72 N = 36 (LT SL): N = 36(ST SL) **IG** = 36:**CG** = 36/ into ST and LT SL	I: CBT RTW prog. (+ TAU)	TAU: no CBT, but contact with health professionals	-BL, PI, 6 mths	-No. SL days out of 60 days; -Resilience (CSQ)	+SL for ST not LT SL + Control and ability to reduce pain only for CSQ
24	Myhre (2014), (46) Norway	Total N = 413 **IG=** 209 (203):**CG** = 204(202)	I: Work-focused rehabilitation (at Oslo & Trondheim)	CG: MD rehab	-BL; 12 mths	-RTW (defined as 1st 5 wk period that ppts did not received sickness/ workplace benefits)	-RTW

: *Completed FUs; **No.s for 1^{o} outcomes; *** No.s for 2^{o} outcomes (interpersonally distressed ID, dysfunctional DYS, adaptive copers AC)

a Half ppts assigned to an IG by psychological profile, the rest randomly assigned.

For full key to abbreviations, see Table 3, Appendix 2

Table 2: Risk of bias of included studies

study	*first author*	*random sequence generation*	*allocation concealment*	*outcome assessors blind*	*participants blind*	*personnel blind*	*incomplete outcome data – ITT*	*selective outcome reporting*
1	Alaranta (1994) (62)	U	U	H	H	H	U	L
2	Altmaier (1992) (61)	H	U	U	U	H	U	L
3	Andersen (2015) (51)	L	L	L	H	H	L	L
4	Asenlof (2005, 2009) & Emilson 2017 (36-38)	L	L	H	H	H	L	L
5	Bendix (1995) (43)	L	U	H	H	H	U	L
6	Bendix (1996) (41)	L	U	H	H	H	U	L
7	Bernaards (2006, 2007, 2011) (52-54)	L	U	U	H	U	U	L
8	Bergbom (2014) (44)	U	U	U	U	U	U	L
9	Brendbekken (2017) (34)	L	L	U	H	H	L	L
10	De Buck (2005) (40)	L	L	L	L	H	L	L
11	Eijk-Hustings (2013) (42)	L	L	U	U	U	L	L
12	Ewert (2009) (39)	L	U	U	U	U	H	L
13	Haldorsen (1998a,b,c) (57-59)	L	U	U	U	U	U	L
14	Haldorsen (2002), Skouen (2002), Skouen (2006a) (35, 65, 66)	L	U	U	U	U	L	L
15	Hutting (2013, 2015) (48, 49)	L	L	U	H	H	L	L
16	Jensen (1997a) (60)	L	L	L	U	U	L	L
17	Jensen (2001, 2005) (47, 67)	L	L	L	U	U	H	L
17	Bergström (2012) (10 yr FU of Jensen 2001) (68)	L	L	U	H	H	H	U
18	Jensen (2011) (45)	L	L	H	H	H	L	L
19	Li (2006) (64)	L	H	H	H	H	L	H
20	Lindell (2008) (55)	L	H	U	H	H	L	L
21	Linton (2005) (56)	L	L	U	H	H	U	L
22	Macedo (2009) (50)	L	L	H	H	H	L	L
23	Marhold (2001) (63)	U	U	U	H	H	H	L
24	Myhre (2014) (46)	L	L	H	H	H	H	L

***Ke*y**: H = high risk; U = unclear from paper; L = low risk; ITT = intention to treat; a = not clear if envelope opaque; b= when physicians; H when participant self-rating

Figure 1: Flow diagram of search